# Table Mountain Research Program

## Outputs

- Measurements of aggregate emissions from dynamic frequency selection (DFS) RLAN-type transmitters.
- A prototype of a 3-axis antenna built to study the total incident field and polarization of radiated signals.
- Signal simulators developed to study the characteristics of complex signals such as UWB and man-made noise.

The Table Mountain Field Site and Radio Quiet Zone supports fundamental research into the nature, interaction, and evaluation of telecommunication devices, systems, and services. To achieve this goal, the Table Mountain Research Project actively solicits research proposals both from inside the Institute and from external agencies.

The results of this work are disseminated to the public via technical reports, journal articles, conference papers, web documents, and computer programs. Some highlights of the program are presented below.

### Radar Testing

It was suggested by the International Telecommunication Union - Radiocommunication Sector (ITU-R) Working Party 8B that radar emission spectra might vary as a function of the pointing angle of radar antennas as they turn. If true, it would not be possible to determine a radar's emission spectra by simply measuring at a single location. To assess the possibility that this effect might occur, a maritime radar was set up at the Table Mountain site and its spectrum measured at four different azimuthal locations (see Figure 1). The results, documented in NTIA Technical Memorandum TM-05-430, indicated that no such effect is likely to occur.

Other experiments explored the possibility of antenna pattern variations that occur as a function of frequency.

### DFS Testing

In other work, dynamic frequency selection (DFS) radio local area network (RLAN)-type device prototypes operating at 5 GHz were tested at Table Mountain as aggregates of up to ten clients communicating with an access point (see Figure 2). The purpose of the tests was to determine the spectrum and amplitude probability distribution (APD) characteristics of aggregate DFS emissions. The results of the work were forwarded to the NTIA Office of Spectrum Management (OSM), as part of a broader study of the performance and effectiveness of the DFS prototypes.

### Land Mobile Radio Occupancy Measurements

In the fall of 2004, measurements were conducted in the Washington, DC, area to measure Land Mobile Radio (LMR) channel occupancy in Federal bands 162-174 MHz and 406-420 MHz. This was part of the NTIA effort to improve the spectrum efficiency of Federal radio usage. The goal was to obtain data needed to design shared communication systems for Federal users, and to determine long-term usage trends by comparing results with previous measurements taken in the same location in 1986 and 1989 (see pp. 6-7 for more information).

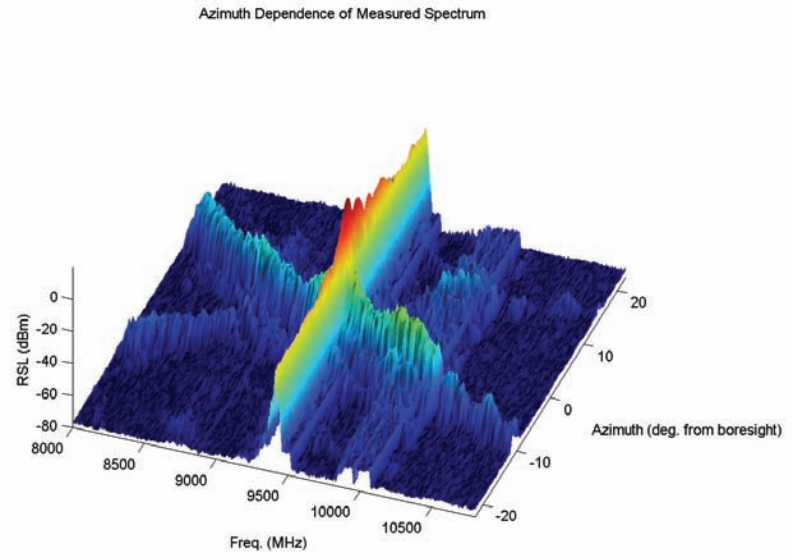


*Figure 1. Three-dimensional view of radar azimuthal emission patterns from 8000-10800 MHz, between ±20 degrees of the radar main beam direction. The color is keyed to received signal level (RSL).*

*Figure 2. DFS testing at Table Mountain (photograph by F.H. Sanders).*

During the summer of 2005 the Table Mountain Research project provided the resources needed to improve upon the existing LMR measurement system. This time the system was deployed to the Denver metropolitan area, and in addition to the frequency bands measured in Washington, DC, preparations were made to measure in bands 30-50 MHz, 138-162 MHz, and 420-450 MHz, as well as several bands in the 800 and 900 MHz regions of the spectrum. The Denver measurements will serve two purposes: (1) to check out recent changes to the measurement system and (2) to supplement the Washington, DC, measurements by measuring LMR usage of both Federal and non-Federal bands in a large city where transmissions are less centrally located.

**FY 2005 Cooperative Research Programs**
(see pp. 50-51 for more information)

- First RF Corporation
- RF Metrics Corporation
- Coherent Technologies
- Deep Space Exploration Society
- University of Colorado

## Recent Publications

F. Sanders and B. Ramsey, "Phased array antenna pattern variation with frequency and implications for radar spectrum measurements," NTIA Report TR-06-436, Dec. 2005.

F. Sanders and B. Ramsey, "Comparison of radar spectra on varying azimuths relative to the base of the antenna rotary joint," NTIA Technical Memorandum TM-05-430, Aug. 2005.

T. Brown, S. Doshi, S. Jdhav, D. Henkel, and R. Thekkekunnel, "A full scale wireless ad hoc network test bed," in "Proceedings of the International Symposium on Advanced Radio Technologies: March 1–3, 2005," J.W. Allen and J. Ratzloff (Eds.), NTIA Special Publication SP-05-418, Mar. 2005, pp. 51-60.

J.W. Allen, "Gain characterization of the RF measurement path," NTIA Report TR-04-410, Feb. 2004.

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